



New Frontiers for Lunar Citizen Science

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Why include citizen science components in your missions?

- Help process large amounts of data
- Take advantage of special circumstances
- Provide mission operations support
- Provide useful background science data

Involving students and citizen scientists gives them a personal stake, and increases their interest and buy-in for the mission, making them among our best ambassadors and advocates.

Dissemination Partners



A public outreach program designed to work with motivated volunteers that communicate the excitement of space exploration missions and information about recent discoveries to people in their local communities. There are now over 500 Ambassadors in 50 states, Washington DC and Puerto Rico.



The Night Sky Network is a nationwide coalition of astronomy clubs bringing the science and inspiration of NASA's missions to the public.

Both of these programs are administered through JPL and the Astronomical society of the Pacific

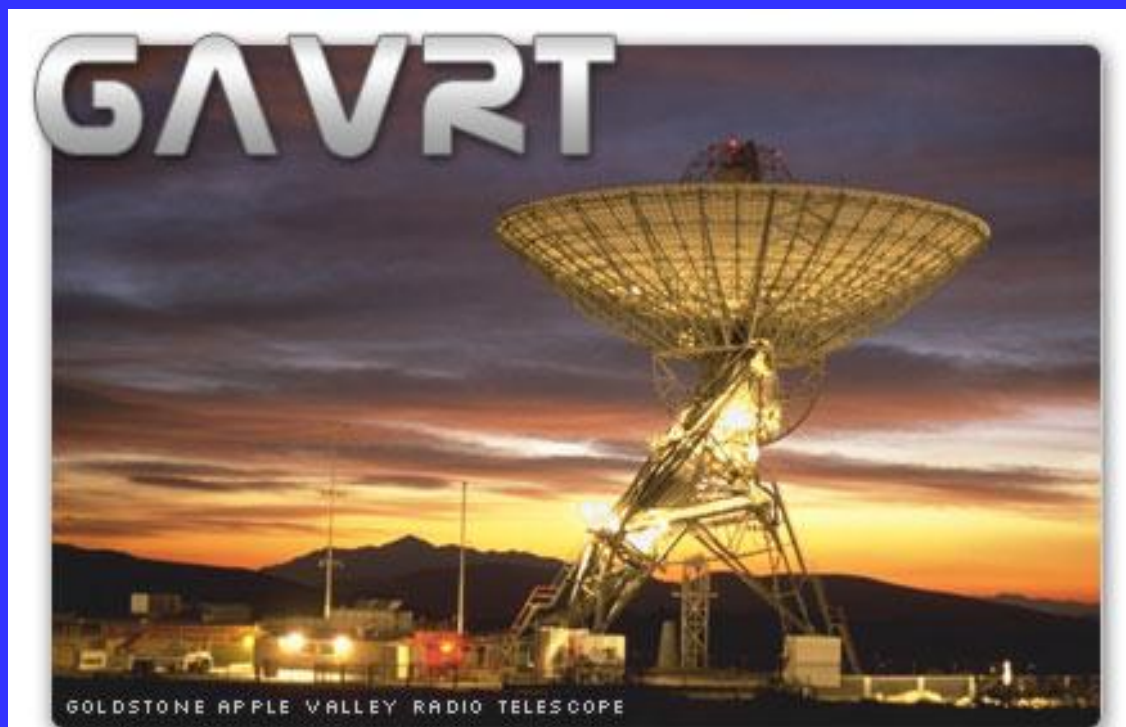
Process Large Amounts of Data: Moon Mappers and Moon Zoo



These programs allow students and members of the public to assist in analyzing the high-resolution images returned by the LROC instrument aboard the Lunar Reconnaissance Orbiter.

Participatory Exploration - Student Telemetry Team

- Directly involving thousands of students around the world in the mission.
- Extension of GAVRT – Goldstone Apple Valley Radio Telescope run by Lewis Center for Educational Research.
- Students can remotely operate 34m Deep Space Network Goldstone dishes from their classrooms to track and monitor status of the LADEE spacecraft in flight.
- <http://www.lewiscenter.org/gavrt/>



Amateur Imaging Capabilities

Image stacking, deconvolution, and wavelet processing are allowing amateurs to obtain resolutions that were only recently only obtainable from spacecraft. All phases of illumination are available.

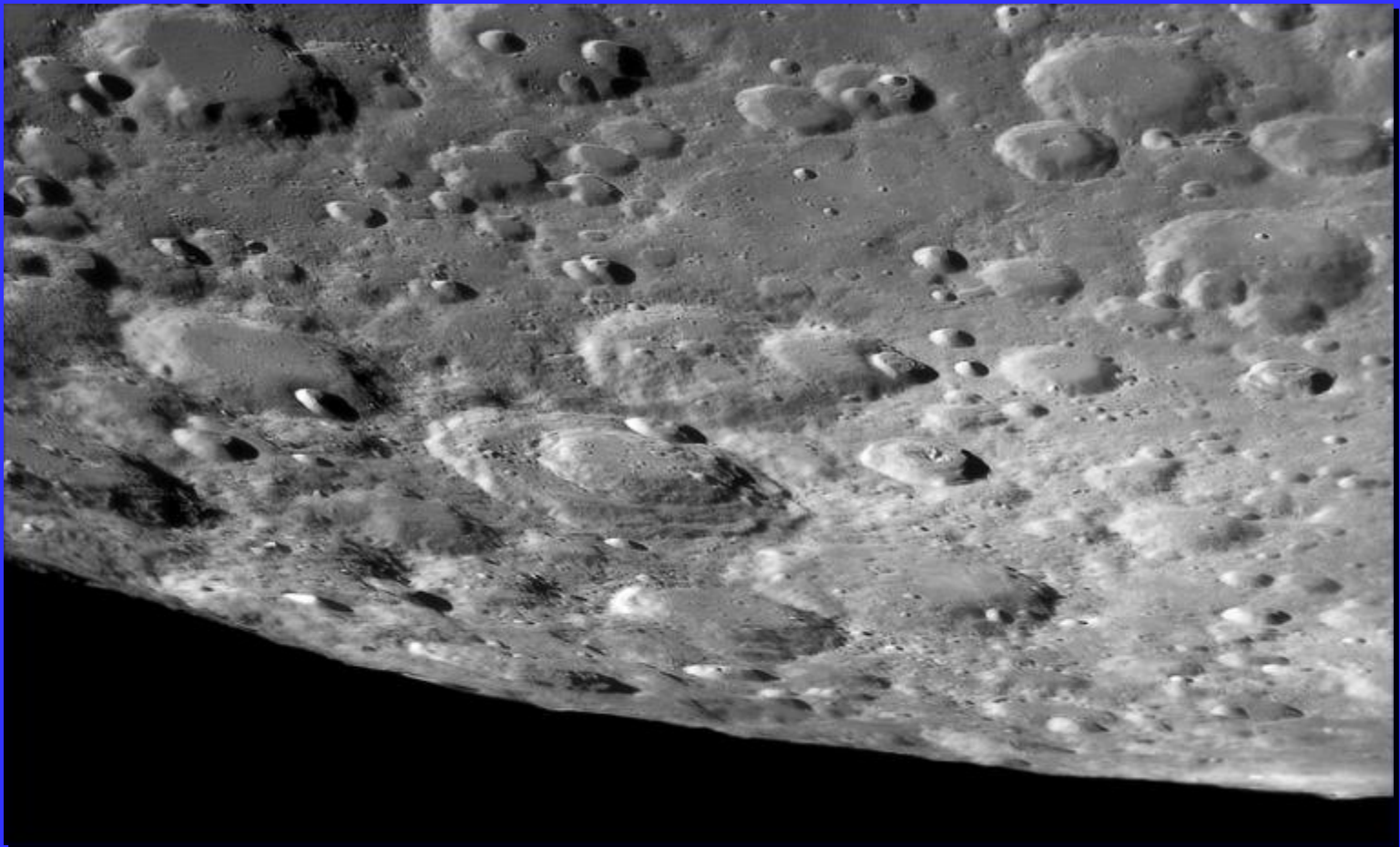


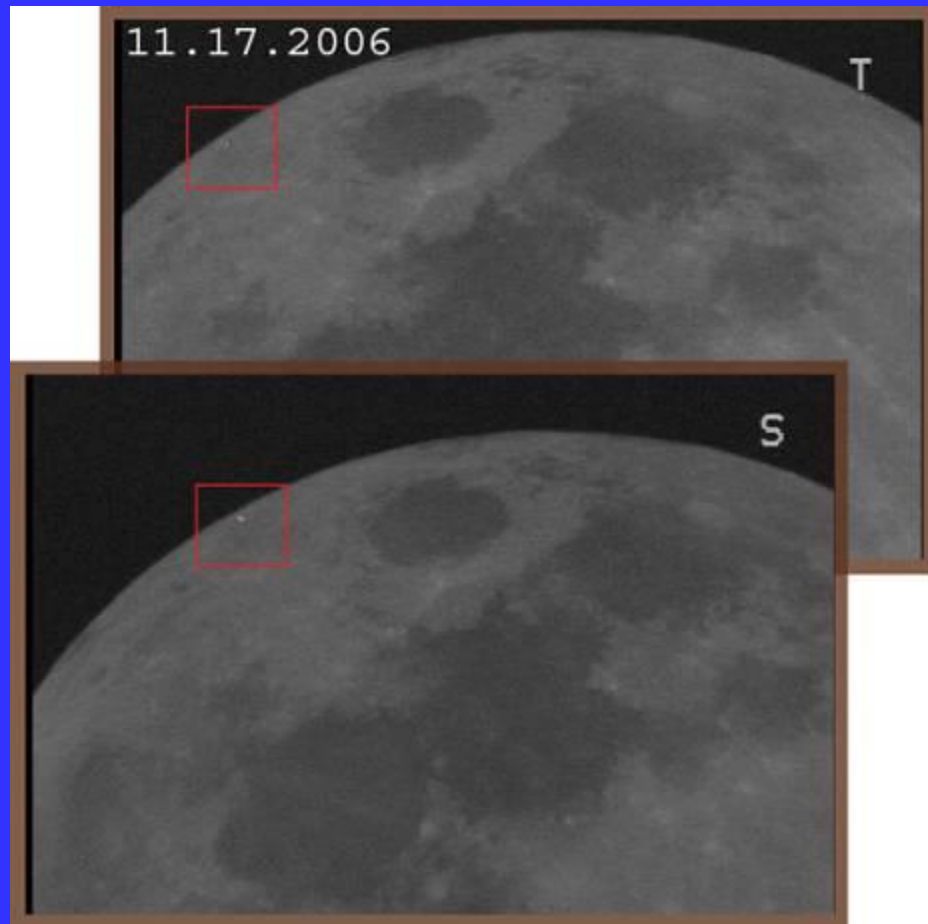
Image of lunar south polar region submitted to LCROSS Observation Campaign by Paolo Lazzarotti

Provide Background Science Data: LADEE and Lunar Impacts

NASA Meteoroid Environment Office Lunar Impact Monitoring Program

- Help lunar scientists determine the rate of meteoroid impacts on the Moon.
- Meteoroid impacts are an important source for the lunar exosphere and dust.
- Can be done with a telescope as small as 8 inches of aperture.

Also working with ALPO Lunar Meteoritic Impact Search Section.



Techniques have been documented and popularized by Brian Cudnik and George Varros.

Provide Background Science Data: Meteor Counting

- Even those who don't have a telescope can still participate in the science of the LADEE mission!
- The vast majority of meteoroids impacting the Moon are too small to be observable from Earth.
- Small meteoroids encountering the Earth's atmosphere can result in easily-observable meteors.
- Conducting counts of meteors during the LADEE mission will allow us to estimate what is happening on the Moon at that time.





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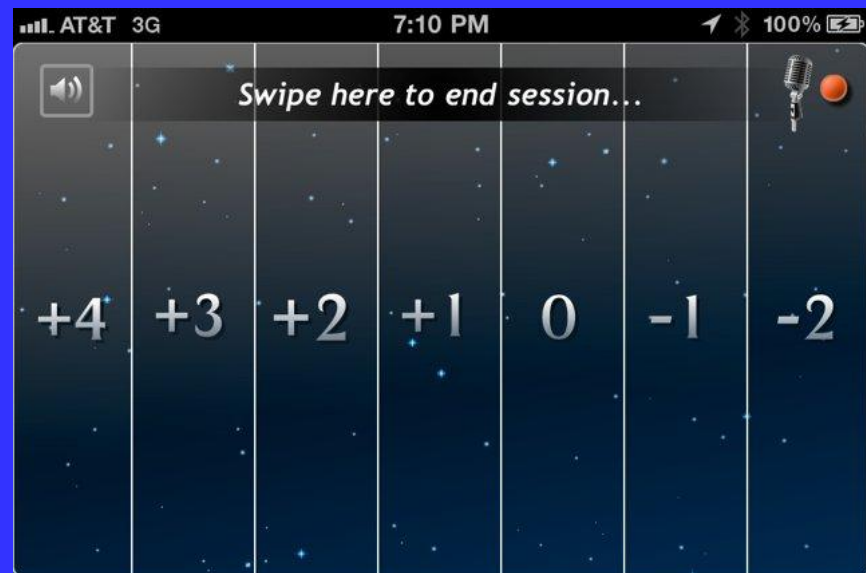
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Meteor Counter

For iPhone, iPad & iPod Touch

Available on the
App Store

<http://meteorcounter.com/>



Advanced amateurs (e.g. Maurice Collins, Raffaello Lena, Richard Evans, Jim Mosher) are using existing tools such as ACT-REACT QuickMap and creating their own tools to process and interpret data from both high-quality amateur imaging as well as from spacecraft data.

“Lena and his colleagues have elevated amateur lunar studies to the professional level. Over the last decade the Geologic Lunar Research Group that Raf founded has produced dozens of published studies of lunar domes, faults and transient phenomena.” – Chuck Wood



“Shannen Ridge” – a previously unknown Imbrium radial ridge found by Maurice Collins.



Organizations

Geological Lunar Researches Group
Selenology Today

Association of Lunar and Planetary Observers
The Lunar Observer

BAA Lunar Section
The Moon: Notes and Records of the Lunar Section

American Lunar Society
Selenology



American Association of Variable Star Observers (AAVSO)

A citizen science project running for over 100 years reached a key milestone when an amateur astronomer contributed the 20 millionth observation of a variable star on February 19, 2011.

